

practical study of surveying in connection with the course in mining. Prof. E. W. McBride, F.R.S., of McGill University, Montreal, has been appointed chief assistant in the zoological department of the college. The title of "Professor Emeritus" has been conferred upon Prof. Tilden, F.R.S., in recognition of his long services as dean of the Royal College of Science and professor of chemistry.

M. PAUL LANGEVIN has been appointed professor of general and experimental physics at the Collège de France in succession to the late Prof. Mascart.

THE Scottish Meteorological Society offers for competition among matriculated students or graduates of the four Scottish universities, including University College, Dundee, a prize of 20*l.* for the best essay on a meteorological subject. As an indication of the kind of essay the council is prepared to consider, the following subject is mentioned:—"A discussion of the extent to which the heat set free when water vapour is converted into the liquid state influences the temperature of the atmosphere, with special reference to the climatology of different parts of Scotland." An essay on any other subject will, however, be equally eligible. The essays must be lodged with the secretary to the Scottish Meteorological Society, 122 George Street, Edinburgh, on or before March 31, 1910.

SEVERAL further gifts to colleges and universities in the United States have been announced. *Science* states that at the recent commemoration of the founding of Johns Hopkins University, which opened thirty-three years ago, it was reported that the gift of Mr. Henry Phipps, of New York, for the psychiatric clinic was considerably in excess of 200,000*l.* A gift of 40,000*l.* to the University of Pennsylvania from an anonymous donor has been announced. The sons and daughters of the late Mr. and Mrs. F. C. A. Denkmann, of Rock Island, Ill., have promised to give a library building to Augustana College, Rock Island, the building to cost not less than 20,000*l.* By the will of Dr. Gordon W. Russell, of Hartford, Trinity College receives 1000*l.* for the natural history department and a collection of books on that subject.

THE Estimates for Civil Services for the year ending March 31, 1910, show an increase compared with the grants in the 1908 session. The provision made for universities and colleges shows an increase of 15,000*l.* for university education in Wales, and among increases under the heading "scientific institutions, &c.," are 2000*l.* for the National Museum of Wales and 4500*l.* for the National Library of Wales. A building grant of 20,000*l.* is made in aid of the building fund of the University College, Bangor. The estimates for the Board of Education show an increase of 60,986*l.* The total estimates for the British Museum are 127,935*l.*, and for the Natural History Museum, South Kensington, 60,543*l.* It is interesting to notice under the estimates for the Board of Education an increase of 23,550*l.* available for grants for secondary schools and the instruction of pupil teachers, and of 20,000*l.* for grants for technical institutions and evening schools.

ON Friday evening, March 12, at the South-Western Polytechnic Institute, Chelsea, the certificates and prizes were distributed by Dr. H. A. Miers, F.R.S., principal of London University. The principal of the polytechnic read a report which showed that the institute had been very successful in the university and other examinations. After the distribution Dr. Miers delivered an address. He said that twenty years ago he had taken a class in electricity at an evening recreative centre under the old School Board in Chelsea, and he felt on this account that his visit to Chelsea was particularly appropriate. His great-grandfather, Francis Place, also had taken a leading part in founding some of the original polytechnics. He said that the great object of education should be to stimulate intellectual effort, and he knew no better way than by studies in science and art. In both it was always possible to discover or to produce something new, provided the student had the seeing eye. He himself had been led to researches and discoveries by chance observations. At a lecture at the Royal Institution one of his experiments on crystallisation had acted differently from his expectation,

and this had led him to a year's successful research. It was the seeing eye, educated by scientific study, which enabled discoveries to be made, and the more alert a student was the more likely he would be able to seize the opportunity when it came. Many discoveries had been made in this way, of which he gave examples. The interest of scientific and artistic studies was to him akin to the sporting instinct, which is merely a sense of expectation and curiosity of what was about to happen. All teachers should try to stimulate the spirit of research.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society, January 14.**—"On the Velocity of the Kathode Rays ejected by Substances exposed to the  $\gamma$  Rays of Radium." By R. D. Kleeman. Communicated by Sir J. J. Thomson, F.R.S.

Part of the kathode radiation from a plate exposed to the  $\gamma$  rays of radium consists of very soft rays which are absorbed in 1 cm. or 2 cm. of air.

The softness of the radiation is practically independent of the thickness of the radiator, and previous sifting of the  $\gamma$  rays through a thick screen.

The radiation appears to be considerably softer on the side of the radiating plate where the  $\gamma$  rays emerge than on the side where they enter.

Measurements of the softness of the radiation for radiators of different materials on the side where the  $\gamma$  rays entered showed that it is practically independent of the nature of the material of the radiator.

The soft radiation produced by the  $\beta$  and  $\gamma$  rays of radium together is of a more penetrating character than that produced by the  $\gamma$  rays alone.

The penetrating kathode rays produced directly by the  $\gamma$  rays have been shown to possess different velocities. It was found that the penetrating power of the kathode radiation from a plate decreases with the increase of absorbability of the  $\gamma$  radiation which produces it.

The velocity of these secondary rays as a whole is as a first approximation, equal to that of the  $\beta$  rays of radium.

March 11.—Sir Archibald Geikie, K.C.B., president, in the chair.—Note on the stability of Jacobi's ellipsoid: Sir G. H. Darwin.—The wave-lengths of lines in the secondary spectrum of hydrogen: H. E. Watson. A great deal of work has been done by numerous investigators with the object of discovering the causes which produce two hydrogen spectra, the view for which there appears to be most evidence being that the primary spectrum arises from atomic hydrogen, and the secondary spectrum from molecular hydrogen. On the other hand, information as to the wave-lengths of the lines is very scanty, the only measurements of the red and yellow lines being those of Hasselberg about the year 1883. The results are based on Angstrom's scale, and were made with a prism spectro-scope, so that they are not very trustworthy. As it seemed highly important to have accurate information on the subject owing to the frequent necessity of eliminating hydrogen lines from a spectrum, the present work was undertaken. About 800 of the lines in the spectrum were measured by means of a Rowland concave grating, the error in the case of the stronger lines being probably not greater than 0.03 Angstrom unit. Many of the lines are very weak, and can barely be photographed even with prolonged exposures. No lines have been detected which are less refrangible than the C line, and very few appear to exist beyond the theoretical limit of the primary series according to Balmer's formula. In fact, of those which were seen in this position, the majority appear to be due to water-vapour, and it does not seem unlikely that the remaining ones are not due to hydrogen. A remarkable feature is an apparently continuous spectrum, which extends from the extreme ultra-violet almost to the visible region. A list is also given of the wave-lengths of thirty-three mercury lines which were seen in the spectrum, and measured with particular care in two orders.—The measurement of dielectric constants by the oscillations of ellipsoids and cylinders in a field of force: W. M. Thornton. The method used was to suspend by a quartz

fibre in an alternating field of force very accurately formed ellipsoids or cylinders of the substance to be tested. The field had an intensity of about 300 volts per cm., and made sinuous alternations at a frequency of 80 a second. The polarisation couple upon the specimen was found by measuring the periods of small swings with and without the field. From these, and the dimensions of the body, the dielectric constant was calculated. The values so found for quartz and flint-glass ellipsoids, carefully made by Messrs. Hilger, agree to one part in a thousand with those calculated by the Sellmeier-Ketteler formula from optical data, and with Hopkinson's values for glass. Substances which could be moulded were formed in a split lead mould, using a steel ellipsoid, also by Hilger, as a matrix. In order that cylindrical specimens could be used, the longitudinal reaction coefficient  $N$  was found for a series of cylinders of known dielectric constants. Liquids were measured by enclosing them in thin paper cylinders suspended in a saddle of silk thread. The air in the testing vessel was thoroughly dried over phosphoric anhydride, and the drying was continued in each case until the period reached a steady value. Quite invisible traces of moisture on the surface of the specimens caused them to behave as conductors, and in the case of water the conductivity of the surface masked the polarisation effect completely. The following values were obtained:—Quartz, parallel to optic axis, 4.606; perpendicular to axis, 4.548. Flint-glass,  $\Delta=4.65$ , 10.64;  $\Delta=4.12$ , 8.52;  $\Delta=3.30$ , 6.98. Paraffin wax, 2.32. Beeswax, 4.75. Shellac, 2.49. Sealing wax, 4.56. Gutta-percha, 4.43. Chatterton's compound, 3.98. Ebonite, 2.79. Amber, 2.80. Ivory, 6.90. Canada balsam, 2.72. Resin, 3.09. India-rubber, 3.08. Sulphur, 4.03. Olive oil, 3.16. Heavy paraffin oil,  $\Delta=0.885$ , 2.55.

**Linnean Society, February 18.**—Dr. D. H. Scott, F.R.S., president, in the chair; afterwards Lieut.-Colonel Prain, C.I.E., F.R.S., vice-president.—Alternation of generations in plants: discussion opened by Dr. W. H. Lang. After some introductory remarks and reference to some examples of well-marked alternation of generations, and the nuclear difference between the two generations, the author adduced the ontogeny of organisms without alternation of generations, the concept of a specific cell corresponding to each specific form. The concept of the specific cell must be applied to organisms with alternation; the bodies of the two alternating individuals in the life-history may be similar or dissimilar. Two alternative explanations of the differences between the two generations in the complete life-history were stated:—(a) that the differences are due to the different state of the specific cell in the spore and zygote respectively; (b) that they are due to different environmental conditions acting on equivalent germ-cells. The mode of reproduction—sexuality or spore-production—appears to be necessarily associated with the state—haploid or diploid—of the specific cell. While the possibility of the different states of the specific cell in the spore and zygote having some causal influence on the difference of the resulting individuals must be borne in mind, it is suggested that this ontogenetic theory of the nature of the alternation seen in Bryophyta and Pteridophyta may prove a useful working hypothesis, that it will lead to work on new lines, and that it is to some extent open to experimental test.

March 4.—Dr. D. H. Scott, F.R.S., president, in the chair.—A contribution to the montane flora of Fiji, including cryptogams, with ecological notes: Miss L. S. Gibbs. The Fiji group consists of 200 islands, only eighty of which are inhabited; Viti Levu is about 4100 square miles in area, with forest-clad mountain ranges, the highest point being Mt. Victoria, 4000 feet in height. The botanical history of the group begins with the visit of H.M.S. *Sulphur* in 1840, and in the same year the Wilkes expedition touched at the islands. The *Herald* called in 1856, and Dr. Seemann visited the group in 1860–1, and embodied his results in his "Flora Vitiensis." Mr. Horne, director of the Botanic Gardens at Mauritius, spent a year collecting in the late 'seventies of last century. Thanks to these investigators, the flora of the lower parts of the chief islands are fairly well known. The author therefore decided to confine her investigations to the region lying at 2900 feet and above, and the three spring months of

August, September, and October were spent at Nadarivatu, the highest inhabited point. From the collections the flora may be described as Indo-Malayan. They contain about forty new species and many new records. Thus, of the eight species of *Piper*, Mr. C. de Candolle found five to be new, and of *Peperomia* all seven proved novelties. The introduction concludes with some observations as to the origin of the flora, and is followed by a systematic enumeration of the whole collection.

**Physical Society, February 26.**—Dr. C. Chree, F.R.S., president, in the chair.—A laboratory machine for applying bending and twisting moments simultaneously: Prof. E. G. Coker. The paper describes a machine built by students of the City and Guilds Technical College, Finsbury, in which uniform bending and twisting moments can be applied simultaneously over the whole length of the specimen, and in any desired proportion to each other. The principle of the design is to suspend a rod at two intermediate points by wires depending from a fixed support. The equal overhanging ends of the rod are loaded by weights  $W$ , so that the applied couple between the points of support is uniform and of amount  $Wa$ , where  $a$  is the length of the lever-arm. The rod is also twisted by weights  $W_1$  attached to equal arms of length  $b$ , so that there is a uniform twisting moment of amount  $W_1b$  between the points of suspension. The two systems of loading are independent, and their ratio can be adjusted to any value desired.—The self-demagnetising factor of bar magnets: Prof. S. P. Thompson and E. W. Moss. This paper consists of three parts:—(1) a discussion of the significance and definition of the self-demagnetising factor of magnets in general, and of bar magnets in particular; (2) a re-determination of the values of the self-demagnetising factor for bar magnets of circular section; (3) determination of the values of the self-demagnetising factor for bar magnets of rectangular cross-section of various proportions. It is shown that, in general, for every bar magnet there is a self-demagnetising action, the value of which at the middle of the bar depends, for a given intensity of magnetisation, on the length of the bar relatively to its cross-section, on the permeability of its parts, and on the distribution of its surface-magnetism. Owing to the circumstance that with every kind of steel the permeability is neither constant nor stands in any simple relation to the flux-density, any calculation of the actual polar distribution for rods and bars is impracticable. The only form of magnet that is practicable for calculation is that of the ellipsoid, the properties of which are that for any and every value of the permeability, and in any uniform field, the surface magnetism is so distributed that the magnetic force which this distribution exerts in the interior is uniform at every point within, and therefore the internal demagnetising force everywhere within is constant.

**Zoological Society, March 2.**—Mr. G. A. Boulenger, F.R.S., vice-president, in the chair.—The development of the subdivisions of the pleuro-peritoneal cavity in birds: Miss Margaret Poole.—The growth of the shell of *Patella vulgata*, L.: E. S. Russell. The breeding season of this limpet extends from July to January. Sexual maturity is reached at a length of 20–25 mm. An average size for a limpet of the last season's brood in January or February is 10 mm.; at the end of the first year it may be 29 mm. Probable sizes at the end of the second and subsequent years are 38 mm., 44 mm., 48 mm., 53 mm. Shells more than 50 mm. may be considerably more than five years old. Sexual maturity is reached in the first year, and when the limpet is only half-grown. The rate of growth decreases with age and maturity, and is slower during the colder months of the year. Considerable changes take place in the ratios of the shells' dimensions during growth, being probably in large part the expression of "laws of growth," and not due to natural selection.—The life-history of the agrionid dragon-fly: Frank Balfour-Browne.—Growth stages in the British species of the coral genus *Parasmilia*: W. D. Lang.

**Mathematical Society, March 11.**—Prof. W. Burnside, vice-president, in the chair.—The transformation of the electro-dynamical equations and the laws of motion: H. Bateman. The paper is occupied with the development of some ideas introduced into the subject by Minkowski.



The transformations, which leave the electrodynamic equations unaltered in form, are obtained by considering the invariance of two integral forms of which the coefficients are the components of the electric and magnetic vectors. In obtaining these transformations use is made of a pair of integral formulæ which have been used as equivalents of the electrodynamic equations by R. Hargreaves.—The transformation of the electrodynamic equations of moving bodies: E. **Cunningham**. The equations for moving media have been deduced from the general electrodynamic equations by Lorentz by the use of a method of averaging. The question discussed in the paper is that of the changes produced in the equations for moving media by those transformations for which the electrodynamic equations are invariant.—The kinetic image of a convected electric system formed in a conducting plane sheet: Prof. J. **Larmor**. The question arises in connection with recent observations of the magnetic fields in the neighbourhood of sun-spots. It appears that such fields are confined to thin layers, and this effect is traced to the action of conducting layers in screening the magnetic fields due to moving charges. The details of the screening action are worked out by adapting the method used by Maxwell in the discussion of the effects produced by a magnetic pole moving in the neighbourhood of a conducting disc.—An integral equation: G. H. **Hardy**. The paper is occupied with functions defined by an integral formula which is a generalisation of Fourier's integral theorem.—Term-by-term integration of oscillating series: Dr. W. H. **Young**.—Further researches in the theory of elimination: A. L. **Dixon**.

## CAMBRIDGE.

**Philosophical Society**, February 22.—Prof. Sedgwick, president, in the chair.—The alleged influence of lecithin on the determination of sex in rabbits: R. C. **Punnett**.—Observations on the changes in the common shore crab caused by *Sacculina*: F. A. **Potts**. Giard first showed that the association of the parasitic cirripedes, the Rhizocephala, with crustacean hosts is the cause of sexual modification in the latter. In the spider crabs, the male, at the moult after infection, takes on all the external characters which are associated with the female. These changes are associated with the suppression of the gonads. In the common shore crabs the modification is of a much lower grade. In a single character the parasitised male becomes intermediate between normal male and female. The female, as in the case of the spider crabs, seems incapable of change toward the male type. The male gonads may still remain in reproductive activity under the influence of the parasite, though the female is restrained from producing mature eggs.—A so-called "sexual" method of forming spores in bacteria: C. C. **Dobell**. The paper was an attempt to show that the process which has been described as a "conjugation" in certain disporic bacteria (*Bacillus butschlii* and *B. flexilis*) should really be interpreted quite differently. From a study of the spore-formation of *Bacillus spirogyra* and *Bacterium lunula*, n.sp., the author was led to conclude that the "conjugation" represented really an abortive cell-division, and hence that no "sexual" phenomena exist. The bearing of these observations upon the problems of the sexuality of the Protista and the affinities of the bacteria were briefly indicated.—The migration of the thread-cells of *Moerisia*: C. L. **Boulenger**. The thread-cells of the oral battery of the Egyptian medusa *M. lyonsi* do not develop *in situ*, but are formed in the more proximal parts of the manubrium, whence they make their way through endoderm and structureless lamella to the ectoderm of the mouth region. Similarly, the thread-cells on the tentacles develop in the eye-bearing tentacle-bulbs and migrate to the batteries when completely formed.—A note on a specimen of Pelagothuria from the Seychelles: J. C. **Simpson**. This pelagic holothurian was first discovered off the Pacific coast of America by Agassiz in 1880. Since then it has been taken in the Indian Ocean by the *Valdivia* expedition, and in the North Atlantic by the Prince of Monaco. The present specimen was taken by Mr. Stanley Gardiner in 750 fathoms of water in the Indian Ocean north of the Seychelles. The general features of its anatomy conform

fairly closely to the published descriptions of previous specimens, with the exception of the characteristic swimming membrane, which in this case is composed almost entirely of a sponge, which is evidently living commensally with the holothurian.—The study of discontinuous phenomena: N. R. **Campbell**. A further study of von Schweidler's theory of radio-active "fluctuations," which has been applied experimentally by Kohlrausch, Meyer and Regener, and Geiger. The theory is put in a somewhat more general and complete form, and its application to the interpretation of observations with actual instruments considered at some length. Finally, the validity of the experiments mentioned is discussed.

## DUBLIN.

**Royal Irish Academy**, February 8.—Dr. F. A. Tarleton, president, in the chair.—Theorems on the twisted cubic: M. J. **Conran**. It is shown that the three diameters of a cubical hyperbola are situated in the "plane of centres," and are the medians of the triangle formed by the "points" of the curve in that plane. The intersection of the diameters is the centre of the "locus of centres," and is also the centre of the hyperboidal locus of poles of planes parallel to the plane of centres with respect to the conic sections of the developable. It is, moreover, proved that the osculating planes touch this hyperboloid, and that the points of contact lie on a second twisted cubic with the same plane of centres and the same three diameters. A theory of correspondence is developed from which a number of metrical theorems are deduced. Finally, the geometrical interpretations of some of the invariant and covariant forms of the general equation are given.—Proofs of generalised Fourier sum theorems in trigonometrical and in Bessel functions: Prof. W. McF. **Orr**. Proofs are given of expansions in some respects more general than any which the writer has seen rigorously treated. Any function,  $\phi(x)$ , subject to Dirichlet's conditions, is expressed between the limits  $a, b$ , in the form

$$\sum_{\mu} (Ae^{\mu x} + Be^{-\mu x}),$$

where the admissible values of  $A, B$ , and  $\mu$  are determined by the equations

$$AF_1(\mu)e^{\mu a} + BF_2(\mu)e^{-\mu a} = 0, \quad AF_3(\mu)e^{\mu b} + BF_4(\mu)e^{-\mu b} = 0,$$

the  $F$ 's denoting polynomials. A similar expansion in Bessel functions is established which includes that employed in the treatment of problems in vibratory motion in the space between concentric cylinders and spheres. The method is that of contour integration previously used by Carslaw and others. The nature of the convergence and the possibility of term by term differentiation is discussed to some extent. The statement in a previous paper (see NATURE, December 24, 1908, p. 240) of an integral theorem analogous to Hankel's, involving the derivatives of Bessel functions, is a blunder.—The limestone caves of Marble Arch, Co. Fermanagh: H. **Brodrick**. Several streams descending from the sandstone uplands sink when they reach the limestone, reappearing at intervals at the bottom of pot-holes or cliff-walled depressions, and returning to the open after a distance of about a mile. The course of the stream was determined, so far as practicable, with the aid of rope-ladder work in the pot-holes and a good deal of wading and swimming in the caves. Complete plans were submitted of the water-courses surveyed.

**Royal Dublin Society**, February 23.—Prof. W. F. Barrett, F.R.S., in the chair.—Mechanical stress and magnetisation of iron: W. **Brown**. In this paper are given some quantitative results obtained from experiments with iron wires by varying the following four qualities:—longitudinal magnetisation, longitudinal stress, circular magnetisation, and the cross-sectional area of the wire. The results so found are given in tables and curves.—The quantity of the alkaloid taxine in yew: Richard J. **Moss**. The leaves of common yew grown in south county Dublin were found to contain 0.082 per cent. of taxine, calculated from the weight of the leaves immediately after gathering. The leaves of the variety known as Irish yew or Florence-

Court yew (*Taxus baccata*, var. *fastigiata*), growing at the same place, contained 0.323 per cent. of taxine in one tree and 0.623 per cent. in another. In the fruit taxine was found in the seed only, 0.079 per cent. and 0.082 per cent. in two specimens of Irish yew. The wide variation in the quantity of taxine in the leaves of yew accounts for the very contradictory statements made from time to time about their toxic properties.—A proposed analytical machine: Percy E. **Ludgate**. The paper gives an account of a portable machine designed by the author to evaluate automatically any algebraic function for given values of the variables. Mathematically it is closely allied to the projected analytical engine of Charles Babbage, but it rests on different mechanical principles. The machine is guided in the development of any given function by a perforated "formula-paper," which is specifically prepared for that function. A single "formula-paper" can be used for an infinite number of algebraically identical calculations, the numerical values of the variables for any particular case of the general formula being communicated by a keyboard to the machine, which inscribes them in type-carrying shuttles. The shuttles are compactly stored in two coaxial cylindrical shuttle-boxes. The fundamental operations of the machine, which take place under the guidance of the "formula-paper," are the multiplication of the numbers inscribed in any two shuttles, and the inscription of the product in one or two shuttles. Important features of the machine are the use of a slide-rule method for multiplication, and the adaptation of the binomial theorem to provide a converging series for division. It is claimed that a new rapid method of mechanically performing the carrying of tens is embodied in the machine.

## PARIS.

Academy of Sciences, March 8.—M. Bruchard in the chair.—The rôle of the septic tank in the biological purification of sewage: A. **Müntz** and E. **Lainé**. Whilst the utility of the septic tank in the biological treatment of sewage is generally admitted, there is no general agreement as to whether its chief function is that of a depositing tank or whether the fermentative processes which take place are really an essential step in the purification. According to the authors' experiments, the deposition of the material in suspension is practically all that happens in the septic tank.—The evacuation of tubercle bacilli by the bile in the intestine in animals affected with latent lesions: A. **Calmette** and C. **Guérin**. A portion of any tubercle bacilli introduced into the circulatory system may be eliminated by the hepatic gland and evacuated with the bile in the intestine. Owing to the bile acting on the envelope of the bacilli, the latter are more easily absorbed by the healthy intestinal membrane, and hence re-infection may easily take place.—The determination of conjugate systems: S. **Carrus**.—The generalisation of a theorem of Poisson: Th. **De Donder**.—Certain systems of differential equations: E. **Goursat**.—The multiform integrals of algebraical differential equations: Pierre **Boutroux**.—The thermal effects of the musical arc: M. **La Rosa**. From the sugar carbon heated in the musical arc, an experiment described in an earlier communication, small crystals possessing some of the properties of diamonds have been isolated.—Electrocapillary actions and discharge in rarefied gases: G. **Reboul**.—The unsymmetrical effect produced by a continuous current in chains of aqueous solutions of electrolytes possessing a common ion: M. **Chanoz**.—The part played by impurities in the photoelectric effect with liquids: Eugène **Bloch**. The effects have been traced to a superficial layer of grease. Water carefully purified, and placed in a vessel freed from all traces of grease, does not show the Hertz effect, but simply stirring with the finger is sufficient to make this water strongly photoelectric.—The hypothesis of the existence of positive electrons in vacuum tubes. Reply to the note of M. J. Becquerel: A. **Dufour**. The author strongly denies the necessity of the hypothesis of the existence of positive ions to explain the phenomena described by M. J. Becquerel.—Spectrophotometry with a monochromatic field: J. **Thovert**.—The influence of

impurities on the thermoelectric power and resistance of aluminium: H. **Pécheux**. The amounts of iron and silicon were determined in three specimens of aluminium, and measurements made of the resistance and also of the electromotive forces of Al/Cu thermocouples.—Researches on the coefficient of diffusion of the actinium emanation: G. **Bruhat**. The actinium emanation was shown to behave like a gas, since the coefficient of diffusion was found to vary inversely as the pressure. Measurements of the rate of diffusion into carbon dioxide and into hydrogen were then made, leading to 70 as the approximate molecular weight of the actinium emanation.—Observations on spontaneous crystallisation: René **Marcellin**. The hypothesis of the preexistence of crystalline nuclei in the solution does not accord with the experimental facts given in this paper; on the other hand, the supposition that particles of dust in suspension form the starting points of the crystals appears to be very probable.—The nature of the metatungstates and the existence of rotatory power in crystals of potassium metatungstate: H. **Copaux**.—The phosphides of tin: Pierre **Jolibois**. By heating together phosphorus and tin under atmospheric pressure, the phosphide,  $\text{Sn}_4\text{P}_3$ , is the only definite compound capable of isolation in the pure state. Heating in a closed tube under pressure the compound  $\text{SnP}_3$  was obtained. Chemical and microscopical examination confirmed the existence of these compounds; ingots containing tin and phosphorus in other proportions were shown to be heterogeneous, and hence such phosphides as  $\text{Sn}_3\text{P}_2$ ,  $\text{Sn}_2\text{P}$ ,  $\text{Sn}_3\text{P}_2$ ,  $\text{SnP}$ , and  $\text{SnP}_2$ , described by earlier workers, have probably no real existence.—Experiments on an old vitrified glass which had become violet coloured under the influence of the sun's rays: M. **Delachanal**.—A new method for determining the constitution of the sugars: M. **Hanriot**. This method is based on the formation of a chloralose, by the addition of chloral, and subsequent oxidation to a chloralic acid. It applies to any  $\text{C}_5$  or  $\text{C}_6$  aldehydic sugar, but fails with the two ketones (levulose and sorbose) examined.—The preponderance of temperature in direct decompositions: the case of the benzoic and salicylic esters: Albert **Colson**.—The transformation of pinonic acid into 1:3-dimethyl-4-phenylacetic acid: Ph. **Barbier** and V. **Grignard**. This unexpected intramolecular change, in which the tetramethylene ring is opened up and a hexamethylene ring formed, takes place under the action of bromine and water at 100° C. The yields are good, and a crude pinonic acid may be used in the preparation.—The preparation of the anhydrides of cyclic and acyclic acids: A. **Béhal**. A study of the action of benzenyl chloride upon the fatty acids.—The normal heteromerism of *Phlox subulata*: Paul **Vuillemin**.—The experimental determination of the effective doses of the X-rays retained by the tissues of the organism: H. **Guilleminot**.—The action of the quartz mercury vapour lamp on the toxin of tetanus: Jules **Courmont** and Th. **Nogier**. After a long exposure to the mercury lamp the activity of the toxin is slightly diminished.—The action of d'Arsonvalisation on the peripheral circulation: E. **Doumer**.—The constitution of the macronucleus of the ciliated infusoria: E. **Fauré-Frémiet**.—The interstitial granulations of striated muscular fibres: Cl. **Regaud** and M. **Favre**.—The structure acquired by the seminiferous canal of the common mole (*Talpa europaea*) after the period of reproduction: A. **Lécaillon**.—The discovery of a Danian horizon with echinids in the basin of Seybouse, Algeria: J. Daresté **de la Chavanne**.—The physico-chemical variations of sea-water on the coast at Concarneau: R. **Legendre**.

## CALCUTTA.

Asiatic Society of Bengal, February 3.—On the correlations of areas of matured crop and the rainfall and certain allied problems in agriculture and meteorology: S. M. **Jacob**. Apart from the fact that the data of this paper differ from those considered by Blanford, the special object has been to find equations which will predict within certain limits of error the amount of a crop from the rainfall on which it depends. These equations are the well-known regression equations, and in forming them the author



believes that at any rate a first approximation to scientific prediction is attained. In each case diagrams are given from which the probable extent of a crop can be found from the antecedent rainfall for the localities considered. In this part of the paper there is also a theoretical discussion of the way in which the regression equations are modified by errors of measurement such as certainly occur for agricultural statistics, and to a less extent in rainfall data. In part ii. the distribution of rainfall, a fundamental problem both for agriculture and meteorology, is considered by the method of curve fitting developed by Prof. Karl Pearson.—Mosquito-larvæ-eating propensity of the genus *Haplophilus*: B. L. Chaudhuri. A note suggesting that fish of this genus are useful in keeping down mosquitoes, and saying that further observations will be made.

## GÖTTINGEN.

**Royal Society of Sciences.**—The *Nachrichten* (physico-mathematical section), No. 4, for 1908, contains the following memoirs communicated to the society:—

July 11.—The uniformisation of given analytical curves, iii.: Paul Koebe.

October 31.—The valency between metals and oxygen, and its dependence on temperature: W. Blitz.

December 19.—The kinetics of dissociation-equilibrium and reaction-speed: F. Krüger.—The conformal representation on a circular lamina of a solid angle determined by the intersection of a finite number of regular analytical surfaces: Paul Koebe.

## DIARY OF SOCIETIES.

## THURSDAY, MARCH 18.

ROYAL SOCIETY, at 4.30.—An Attempt to Detect some Electro-optical Effects: Prof. H. A. Wilson, F.R.S.—On the Influence of their State in Solution on the Absorption Spectra of Dissolved Dyes: Dr. S. E. Sheppard.—The Ferments and Latent Life of Resting Seeds: Miss Jean White.

ROYAL INSTITUTION, at 3.—Recent Advances in Agricultural Science: A. D. Hall.

LINNEAN SOCIETY, at 8.—The Dry-rot of Potatoes: Miss Sihyl Longman.—The Structure and Affinities of *Davidia involucrata*, Baill.: A. Horne.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Experiments upon the Forces acting on Twist-drills when operating on Cast-iron and Steel: D. Smith and R. Poliakoff.

## FRIDAY, MARCH 19.

ROYAL INSTITUTION, at 9.—Experiments at High Temperatures and Pressures: Richard Threlfall, F.R.S.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Some Aspects of Chemical Engineering: C. J. Guttman.

## SATURDAY, March 20.

ROYAL INSTITUTION, at 3.—Properties of Matter: Sir J. J. Thomson, F.R.S.

## MONDAY, MARCH 22.

ROYAL SOCIETY OF ARTS, at 8.—Steam Turbines: Gerald G. Stoney.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Colorado Canyon: Some of its Lessons: Prof. W. M. Davis.

## TUESDAY, MARCH 23.

ROYAL INSTITUTION, at 3.—The Evolution of the Brain as an Organ of Mind: Prof. F. W. Mott, F.R.S.

MINERALOGICAL SOCIETY, at 8.—On a Stage-goniometer for Use with the Dick-pattern of Microscope: Prof. H. L. Bowman.—On the Electrostatic Separation of Minerals: T. Crook.—On the Identity of Guarinite and Hiortdahlite: Dr. F. Zambonini (with Chemical Analyses by Dr. G. T. Prior).—Note to a Paper "On the Comparison of Refractive Indices of Minerals in Thin Sections": Dr. J. W. Evans.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—Exhibition of Flint Implements of the "Older Series" from Ireland: Miss N. F. Layard.—Melanesians and Polynesians: Rev. Dr. Brown.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Construction and Wear of Roads: A. Mallock, F.R.S.

## WEDNESDAY, MARCH 24.

GEOLOGICAL SOCIETY, at 8.—Glacial Erosion in North Wales: Prof. W. M. Davis.

ROYAL SOCIETY OF ARTS, at 8.—Afforestation and Timber Planting in Great Britain and Ireland: Dr. J. Nisbet.

## THURSDAY, MARCH 25.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Liberation of Helium from Radio-active Minerals by Grinding: J. A. Gray.—On *Sphaerostoma ovale* (*Conostoma ovale* et *intermedium*, Williamson) and *Crossotheca Grievii*, the Ovale and Pollen-synangium of *Heterangium Grievii*: Miss M. Benson.

ROYAL INSTITUTION, at 3.—On Aërial Flight in Theory and Practice: Prof. G. H. Bryan, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Electrical System of the London County Council Tramways: J. H. Rider.

ROYAL SOCIETY OF ARTS, at 4.30.—Native Man in Southern India: Edgar Thurston.

## FRIDAY, MARCH 26.

ROYAL INSTITUTION, at 9.—Recent Results of Astronomical Research: A. S. Eddington.

PHYSICAL SOCIETY, at 5.—Note on the Production of Steady Electric Oscillations in Closed Circuits and a Method of Testing Radio telegraphic Receivers: Prof. J. A. Fleming, F.R.S., and G. B. Dyke.—The Effect of an Air Blast upon the Spark Discharge of a Condenser Charged by an Induction Coil or Transformer: Prof. J. A. Fleming and H. W. Richardson.—On the Action between Metals and Acids and the Conditions under which Mercury causes Evolution of Hydrogen: Dr. S. W. J. Smith.

## SATURDAY, MARCH 27.

ROYAL INSTITUTION, at 3.—Properties of Matter: Sir J. J. Thomson, F.R.S.

## CONTENTS.

PAGE

New Lights on Protoplasm in Plants . . . . .	61
Admissions of an Anti-Vivisectionist. By E. S. G. . . . .	63
Strength of Structures and Materials . . . . .	64
Wireless Telegraphy. By Maurice Solomon . . . . .	65
Our Book Shelf:—	
Darmstaedter: "Handbuch zur Geschichte der Naturwissenschaften und der Technik" . . . . .	66
Thomas: "British Butterflies and other Insects" . . . . .	67
Mortimer and Coulthurst: "The Oil and Bromoil Processes" . . . . .	67
Letters to the Editor:—	
Suggested Effect of High-tension Mains.—Sir Oliver Lodge, F.R.S. . . . .	67
Scientific Societies and the Admission of Women Fellows.—Dr. T. E. Thorpe, C.B., F.R.S. . . . .	67
The Isothermal Layer of the Atmosphere.—E. Gold . . . . .	68
The Promotion of Scientific Research.—Walter B. Priest . . . . .	68
The "Daylight Saving" Bill.—L. C. W. Bonacina . . . . .	69
Fireball of February 22.—W. F. Denning . . . . .	69
Unusual Condition of Nasal Bones in Sphenodon.—H. W. Unthank . . . . .	69
English Earthworks and their Orientation. ( <i>Illustrated</i> .) Rev. John Griffith . . . . .	69
Darwin Celebrations in the United States. ( <i>Illustrated</i> .) By H. F. O. . . . .	72
An Imperial Bureau of Anthropology. By Dr. A. C. Haddon, F.R.S. . . . .	73
Notes . . . . .	74
Our Astronomical Column:—	
Stellar Evolution . . . . .	79
Hale's Solar Vortices . . . . .	79
Comet Tempel <sub>3</sub> Swift, 1908 <i>d</i> . . . . .	79
The Cape Observatory . . . . .	79
Hours of Sleep for Children . . . . .	79
Magnetic Rays. ( <i>Illustrated</i> .) By R. S. W. . . . .	80
Prize Subjects for Scientific Research . . . . .	80
Papers and Reports on Insects . . . . .	81
Explosive Combustion, with Special Reference to that of Hydrocarbons. By Prof. W. A. Bone, F.R.S. . . . .	81
Supplementary List of Forthcoming Books of Science . . . . .	85
University and Educational Intelligence . . . . .	85
Societies and Academies . . . . .	86
Diary of Societies . . . . .	90